

### REMARKS

This document is filed in reply to the office action dated October 21, 2004 ("Office Action").

At the Examiner's request, Applicants have (1) amended the Specification to insert the priority information that appears in the transmittal letter filed with this application, and (2) replaced Figs 3, 11, and 14 shown in black-and-white with a version in color. Applicants have also amended the Specification to correct a typographical error.

Applicants have narrowed claim 21, drawn to a method for changing plant fragrance via gene expression modulation, by (i) specifying an approach to perform the gene-modulating step, and (ii) reciting a step for determining a fragrance change. Support for the amendments appear at, e.g., page 31, line 8 to page 32, line 2; and page 33, lines 7-25. Further, Applicants have replaced the term "controlling" recited in this claim with "changing," support for which can be found in original claim 26. Applicants have also narrowed claim 26, drawn to a transgenic plant, by limiting the plant to carnation and reciting the *fht* gene. Finally, Applicants have amended claims 25, 29, 32, 39, and 40 to promote clarity, correct a typographical error, or change claim dependency. No new matter has been added.

Claims 1-40 are pending. Claims 1-20, 27, and 28 have been withdrawn from further consideration for being drawn to a non-elected invention. Claims 21-26 and 29-40 are now under examination. Reconsideration of this application is requested in view of the following remarks:

#### Objection to the Specification

The Examiner objected to the Specification on three grounds. See the Office Action, page 2, lines 6-17 and page 3, lines 9-11. In view of the above amendments to the Specification, Applicants submit that this objection has been overcome.

#### Objection to Information Disclosure Statement

According to the Examiner, "[t]he IDS is objected to for failing to state the year and source of publication for ... Zuker et al. ..." See the Office Action, page 3, lines 1-8.

Applicants would like to point out that, contrary to the Examiner's statement, the PTO-1449 form clearly provides the allegedly missing information. See the PTO-1449 form (copy attached as "Exhibit A"), sheet 2, Ref. AW. It is requested that the objection be withdrawn.

Rejection under 35 U.S.C. § 112, second paragraph

The Examiner rejected claims 25 and 29-39 for indefiniteness on three grounds. See the Office Action, page 3, line 16 through page 4, line 12. In view of the above amendments, Applicants submit that this rejection has been overcome.

Rejection under 35 U.S.C. § 112, first paragraph

The Examiner rejected claims 21 and 29-40 for lack of enablement on three grounds. Applicants have amended claims 21 and 29, and address each ground below. Discussed first is claim 21, which originally is drawn to a method for controlling the fragrance of a plant by modulating gene expression in the anthocyanin-biosynthetic pathway.

I

According to the Examiner, "[t]he specification does not teach the modulation of anthocyanin-biosynthetic pathway genes ... in such a manner as to result in both upward and downward emission of fragrance in carnation plants." See the Office Action, page 6, lines 6 through page 4, lines 12-15.

Applicants would like to point out that the present invention teaches controlling the fragrance of a plant by changing the relative amounts of various volatile molecules, such as benzoic acid derivatives, produced by the plant. See, e.g., the Specification, page 8, lines 12-14. Also, as pointed out in the Declaration by the lead inventor Dr. Vainstein ("Exhibit B"), the fragrance of a plant is a function of both the relative amounts of various volatile molecules produced by the plant and the integration of the sensations by one who smells. See paragraphs 5 and 6. In fact, it is well known in the art that the "scent [of a plant] is a composite character that is determined by a complex mixture of low-molecular-weight volatile molecules." See Vainstein et al., Plant Physiol. Vol. 127, 2001, p1383 (copy attached to Exhibit B as annex "C"). In other words, the claimed method is drawn to controlling the fragrance by changing the relative amounts of various volatile molecules, instead of achieving "upward [or] downward emission of

fragrance.” Thus, the Specification does not need to teach “in such a manner as to result in both upward and downward emission of fragrance ...” In the sole interest of moving this case toward allowance, Applicants have replaced the term “controlling” recited in original claim 21 with “changing.”

## II

It is the Examiner's position that “the specification does not teach a method of changing fragrance of one form to another.” See the Office Action, page 6, lines 16-17.

Applicants disagree. As mentioned above, the Specification provides general teachings as to how to change relative amounts of various volatile molecules produced by a plant, thereby changing the fragrance. To this end, it also provides an working example. See, e.g., page 8, lines 15-25; and page 29, line 23 through page 34, line 11. In view of these teachings and the remarks set forth in Section I above, it is submitted that the Examiner's position is untenable.

## III

To support his conclusion that undue experimentations would be required to practice the method of claim 21, the Examiner provided three comments on the Specification's teachings about the anthocyanin-biosynthetic pathway. Applicants address each comment below:

First, the Examiner commented that “[t]he specification fails to ... teach specific role(s) and or mechanism(s) associated with the control of fragrance in carnation by anthocyanin-biosynthetic pathway gene(s).” See the Office Action, page 6, lines 14-16.

Applicants note that the anthocyanin-biosynthetic pathway is well known in the art. This pathway generates compounds that result in various pigments. See the Specification, page 4, line 29 through page 5, lines 15, as well as Fig. 17 which shows various metabolites, enzymes, and metabolic flows in the pathway. More importantly, the Specification provides ample teachings about this pathway and its role in controlling the fragrance of a plant, i.e., different combinations of metabolites produced in this pathway generate various fragrances. In view of these teachings, one skilled in the art would recognize that he or she could control levels of metabolites in the pathway and change the fragrance accordingly. Thus, contrary to the Examiner's comment, the Specification clearly teaches “specific role(s) and or mechanism(s) associated with the control of fragrance in carnation by anthocyanin-biosynthetic pathway gene(s).”

Second, according to the Examiner, “[t]he specification fails to provide guidance for method(s) for controlling fragrance of any plants other than by decreasing fht gene expression of an fht encoding sequence in anti-sense orientation.” See the Office Action, page 6, lines 10-12.

Applicants would like to point out that the fht gene encodes FHT, which is just one of the enzymes in the anthocyanin-biosynthetic pathway. According to Fig. 17, other enzymes in the pathway include chalcone synthase (CHS), chalcone flavanone isomerase (CHI), dihydroflavonol 4-reductase (DFR), ... etc. Note that it is well known that one could change the levels of metabolites produced in a biochemical pathway by changing levels of enzymes in that pathway. Indeed, the Specification provides ample guidance for controlling the fragrance of a plant by decreasing the fht gene expression. In view of the guidance, one skilled in the art would recognize that the fragrance could be changed by changing the expression level of any of the other enzyme genes in the same manner. Thus, there is no need to provide specific guidance for these genes.

Admittedly, the working example in the Specification teaches using anti-sense technology to regulate the fht gene expression level. Nonetheless, one skilled in the art could recognize that other standard techniques can also be used to achieve the same results. For example, as pointed out in Dr. Vainstein's Declaration (“Exhibit B”) and annexes “D” and “E” attached thereto, RNAi and other techniques can also be used. As all needed techniques are routine, no undue experimentation is required.

Third, the Examiner stated that the Specification did not “provide guidance concerning proteins or other factors that regulate anthocyanin-biosynthetic pathway genes.” See the Office Action, page 6, lines 17-19. Applicants would like to point out that various in vivo or in vitro systems and techniques are available for evaluating whether a factor regulates the expression of a gene, such as one in the anthocyanin-biosynthetic pathway. As long as a factor can modulate the gene expression, one can use it to practice the method of claim 21. Again, no undue experimentation is required since all needed techniques are routine.

For the remarks above, Applicants submit that claim 21 meets the enablement requirement. The Examiner rejected claims 29-40 on the same grounds. Claims 29-39, dependent from claim 21, are directed to specific embodiments of the method of claim 21.

Claim 40 is drawn to a transgenic carnation plant prepared by the method of claim 31. For the same reasons above, claims 29-40 also meet the enablement requirement.

Rejection under 35 U.S.C. § 102(b)

The Examiner rejected claim 21 and 23-26 for being anticipated by Van der Krol et al, Nature, 1988, vol. 333, pp866-869 ("Van der Krol") or International Application PCT/AU93/00127 by Holton et al. ("Holton"). See the Office Action, page 7, lines 14 and 15; and page 8, lines 3 and 4, respectively.

Applicants respectfully traverse and discuss claim 21 first. Claim 21, as amended, is drawn to methods for changing the fragrance of a plant by modulating the expression of genes in the anthocyanin-biosynthetic pathway. It includes **a fragrance-determining step**.

According to the Examiner, Van der Krol teaches inhibiting flower pigmentation of a plant using an antisense chalcone synthase gene. As the chalcone synthase gene is a gene in the anthocyanin-biosynthetic pathway, the Examiner concluded that Van der Krol inherently teaches the method of claim 21. Applicants note that Van der Krol, whose techniques are limited to flower pigmentation, does not even mention a fragrance of a plant. It does not teach or suggest a method of changing the fragrance, let alone **a fragrance-determining step**, as required in amended claim 21. Thus, claim 1 is novel over Van der Krol.

Holton teaches genetically modifying a plant to reduce endogenous or existing flavonoid 3'-hydroxylase activity for changing flower color. Like Van der Krol, it does not teach or suggest a method of changing the fragrance, let alone **a fragrance-determining step**. Thus, it does not anticipate claim 1 for the same reason set forth immediately above. Applicants note that the method of claim 21 includes modulating the expression of genes in the anthocyanin-biosynthetic pathway, e.g., flavanone 3-hydroxylase. It appears that the Examiner has mistaken this flavanone 3-hydroxylase with the enzyme flavonoid 3'-hydroxylase taught in Holton. As such, he relied on Holton for the rejection. Applicants would like to point out that flavanone 3'-hydroxylase differs from flavonoid 3-hydroxylase. It is submitted that claim 21 is novel over Holton on this additional and independent ground.

For all of the reasons set forth above, claim 21 is novel over Van der Krol or Holton. So are claims 23-25, all of which depend from claim 21. Claim 26, drawn to a carnation generated by the method of claim 24, is also novel for the same reasons.

Rejection under 35 U.S.C. § 103(a)

The Examiner rejected claims 21-26 and 29-40 for obviousness over Holton in view of Lu et al., Bio/Technology 1991, vol. 9, pp864-868 ("Lu") and Bidney et al., Plant Molecular Biology, 1992, 18, pp301-313 ("Bidney"). See the Office Action, page 9, lines 9-11.

Applicants respectfully traverse and will first discuss claim 21. Claim 21 is drawn to methods that include (i) modulating the expression of genes in the anthocyanin-biosynthetic pathway in a plant, and (ii) determining a change in fragrance. As mentioned above, Holton does not teach or suggest these two steps. Lu and Bidney only teach transforming carnation, tobacco, or sunflower with selective marker genes NPTII and GUS. They are not related to the anthocyanin-biosynthetic pathway or do not suggest any fragrance-determining step. As such, they do not rectify the two deficiencies of Holton. Thus, all of the three references, alone or combined, do not suggest claim 21.

Neither do these three references suggest claims 22-25 and 29-39, all of which depend from claim 21. Claim 26 and 40 are drawn to carnation plants generated by the method of claims 24 and 31 respectively. For the same reasons set forth in the preceding paragraph, claims 26 and 40 are also non-obvious over the three cited references.

CONCLUSION

Applicants submit that the grounds for the rejection asserted by the Examiner have been overcome, and that all pending claims define subject matter that is sufficiently described, definite, novel, and non-obvious. Thus, it is submitted that allowance of this application is proper, and early favorable action is solicited.

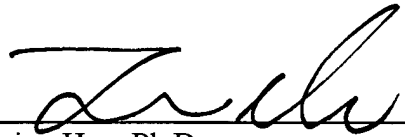
Applicant : Alexander Vainstein et al.  
Serial No. : 09/914,146  
Filed : August 22, 2001  
Page : 15 of 15

Attorney's Docket No.: 13687-002001 / 135107.1

Enclosed please find a Petition for One-Month Extension of Time with the required fee of \$60. Please apply any other charges to deposit account 06-1050, referencing attorney docket 13687-002001.

Respectfully submitted,

Date: 2-17-2005

  
\_\_\_\_\_  
Jianming Hao, Ph.D.  
Reg. No. 54,694

PTO Customer No. 26161  
Fish & Richardson P.C.  
225 Franklin Street  
Boston, MA 02110-2804  
Telephone: (617) 542-5070  
Facsimile: (617) 542-8906

21024319.doc

Applicant : Alexander Vainstein et al.  
Serial No. : 09/914,146  
Filed : August 22, 2001  
Page : 8 of 15

Attorney's Docket No.: 13687-002001 / 135107.1

Amendments to the Drawings:

The attached replacement sheets of drawings replace the original sheets for Figs 3, 11, and 14. The replacement drawings show the figures in color. No new matter has been added.

Attachments following last page of this Amendment:

Replacement Sheet (3 pages)